

The Amended claims, in clean form, are as follows.

14. (Amended) A method for estimating a length of tape on a reel, comprising:  
measuring a first angular position of a tape supply reel;  
measuring a second angular position of a tape take-up reel;  
measuring a third angular position of a capstan engaging the tape; and,  
estimating said length of tape by a processor employing a Kalman filter, said  
Kalman filter responsive to at least one of said first angular position of said tape supply  
reel, said second angular position of said tape take-up reel, and said third angular position  
of said capstan.

15. (Amended) A method for estimating a length of tape on one or more reels,  
comprising:  
measuring a first angular position of a tape supply reel;  
measuring a second angular position of a tape take-up reel;  
measuring a third angular position of a capstan engaging the tape;  
measuring a fourth angular position of a tape tension arm;  
selecting either said tape supply reel or said take-up reel as a selected reel; and,  
estimating said length of tape by a processor employing a Kalman filter, said  
Kalman filter responsive to said angular position of said selected reel, said third angular  
position of said capstan, and said fourth angular position of said tape tension arm.

20. (Amended) A system for measuring how much tape is on a reel from and to which tape is unwound and wound respectively during the rotation of the reel as the tape is moved along a tape path, comprising:

a cylindrical member engaging the tape at a position along the tape path that establishes a tape path length from the reel, said cylindrical member engaging said tape for rotation with the tape as the tape is moved along the tape path;

a first angular position transducer for measuring a first angular position of said reel as the tape is moved along the tape path;

a second angular position transducer for measuring a second angular position of the cylindrical member as the tape is moved along the tape path; and

a processor including a Kalman filter responsive to the first and second angular positions measured by the first and second angular position transducers for calculating how much tape is on said reel.

27. The method of claim 25 further comprising:

- a. choosing a variable to be measured;
- b. selecting a minimum and maximum acceptable measurement value of said variable;
- c. selecting a maximum acceptable variance of said variable;
- d. recording an individual measurement;
- e. determining if said individual measurement's variance is greater than said maximum acceptable variance;
- f. determining if a three sigma-interval around said individual measurement is not at least partially included within an interval from said minimum to said maximum acceptable measurement values;
- g. if the determinations in steps e OR f prove true, ignoring the individual measurement and basing the current Kalman filter estimate on other measurements and on previous Kalman filter estimates.

28. A method for improving a Kalman filter estimate in a series of estimates by ignoring selected measurement values, comprising the steps of:

- a. choosing a variable to be measured;
- b. selecting a minimum and maximum acceptable measurement value of said variable;
- c. selecting a maximum acceptable variance of said variable;
- d. recording an individual measurement;
- e. determining if said individual measurement's variance is greater than said maximum acceptable variance;
- f. determining if a three sigma-interval around said individual measurement is not at least partially included within an interval from said minimum to said maximum acceptable measurement values;

if the determinations in steps e OR f prove true, ignoring the individual measurement and basing the current Kalman filter estimate on other measurements and on previous Kalman filter estimates.

PLEASE ADD NEW CLAIMS AS FOLLOWS

32. The apparatus as in claim 1 wherein said third angular position transducer further comprises:

an encoder responsive to an angular position of a supply reel tension arm.

33. The apparatus as in claim 1 wherein said third angular position transducer further comprises:

an encoder responsive to an angular position of a take-up reel tension arm.